Privileges for Enterprises

Efficient Discrimination or Room for Abuse?

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Working Paper No 02/01

This project (No 99-292) was supported
by the Economics Education and Research Consortium

Research area: **Public Economics**

JEL Classification: D24, H21, H25, L22, L51

TONIS A.S Privileges for Enterprises: Efficient Discrimination or Room for Abuse? — Moscow: EERC, 2002. — pp 1–43.

Although many enterprises in Russia have been privatized, the government still retains its influence over them; they, in turn, also try to attain state guardianship. State patronage over firms often takes the form of privileges (e.g., subsidies, tax discounts or government projects) given to firms in exchange for some "payment" (not necessarily in the monetary form). The purpose of this paper is, firstly, to reveal the incentives of both parties to set up and accept patronage and, secondly, to evaluate the economic consequences of such relations. If the government is non-benevolent, it uses privileges inefficiently. The proposed theoretical model detects the following sources of inefficiency: public goods are underprovided; the absolute level of privileges is too high; the discrimination suppressing inefficient firms may be too severe; and, finally, a self-interested government is likely to support large "old" enterprises with weak incentives to invest, which may negatively affect future economic growth.

Keywords: Russia, privileges, patronage, subsidies, regulation, benevolence of authorities, public goods.

Acknowledgements. The author is grateful to Juan Carrillo, James Leitzel, Judith Thornton, Vladimir Popov and other EERC experts for valuable comments. In addition, the author acknowledges Victor Polterovich, Leonid Polishchuk and all the participants of our GET project for a number of good ideas and fruitful discussions.

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1. INTRODUCTION

As a result of privatization in Russia, many enterprises were passed from public to private ownership. However, the government still keeps up relations with them and retains its influence over their production activities. This is not surprising. On the one hand, the authorities need the support of the private sector, which pays taxes, participates in public projects and helps them to carry out election campaigns. On the other hand, the authorities supply the enterprises with specific resources necessary for successful business: licenses, judicial protection, subsidies and tax discounts. Thus, the authorities and the private sector are in need of each other and have incentives to make arrangements for mutually beneficial cooperation. Such cooperation is called here *patronage*. Usually, patronage over private enterprises is exercised by local (regional) rather than central authorities.

The government can supply the above-mentioned specific resources as public goods so that all firms can enjoy them on equal terms. For example, it can lower taxes or invest in infrastructure or improve the judicial system. These are not cases of patronage because firms need not make special efforts or payments to access the new facilities and will not be deprived of them if they do not pay. Patronage takes place when the facilities are given privately to a specific firm. Such exclusive private goods will be referred to here as *privileges*.

The purpose of this paper is, firstly, to reveal the incentives of both parties to set up and accept patronage and, secondly, to evaluate the economic consequences of such relations.

Classical welfare theory assumes that the economy can be regulated by the "ideal" government which is just a mechanical maximizer of social welfare. However, it would be illusory to believe that this is a characteristic of real authorities, local or any other. They are players in the common game, players with strong power and their own political and commercial interests and incentives. Thus, government intervention in economic activity is not necessarily aimed at improving the life of all agents.

What induces local authorities to set up patronage over firms? There are two main groups of incentives: economic and political. Indeed, in forming a privilege policy, a regional leader may try to achieve economic efficiency and growth or increase government revenues. On the other hand, there are strong social and political factors such as employment, inequality, electoral campaigns; personal relations can also play a significant role in

distributing privileges. As will be discussed a bit later, the political and economic motivations of the government's policy may be contradictory.

The present paper aims to analyze only the economic incentives; the political issues are not going to be considered. I prefer to identify some group of effects rather than try to explain everything.

My main task is to characterize policy distortions generated by patronage if the regional government pursues its self-interests rather than acts benevolently. The theoretical model set up for this purpose has revealed four main distortions.

Firstly, when the government cares too much about its own wealth, it tends to underprovide favorable conditions for production. This may be realized in various ways: for instance, the government may reduce its expenditures on local public goods and infrastructure, or it may impose new taxes and thus increase its revenues and, eventually, the actual incomes of state officials. All actions of this kind are equivalent in their oppressive impact on economic activity.

Secondly, in the presence of privileges, firms are likely to undertake influential activities to win these privileges, and if the government is mercenary or corrupted, it tends to give ("sell") too many privileges. Note that rent dissipation and transaction costs (or opportunity costs to the extent that provision of the same goods for all, simultaneously and equivalently, would cost less to the society) are inevitable consequences of such activities. So, it is better not to patronize at all if there is no real need to discriminate among firms. However, a non-benevolent government gives privileges in any case. Although, if the government cares only about its revenues, the oppressive effect of its policy is so strong that it cannot expect high rents from patronage activity and thus reduces the amount of privileges. The maximal privileges are given by a government which is not absolutely benevolent but cares about social welfare to some extent. The above-described *non-monotonicity* of privileges is an important result presented in this paper.

Thirdly, the discrimination implemented by privileges turns out to be too severe. If a firm uses resources inefficiently, it might be beneficial to discriminate against it, thus decreasing its share in the market (at least if one takes into account only economic factors). But the discrimination may be unwarranted and severe under a non-benevolent government. This can lead to excess concentration in industries.

Finally, large old firms have a relative advantage over small new ones. A mercenary government not only gives excess privileges, it also brings about a bias in their structure, giving large firms more privileges. This may negatively affect investment in new projects and future growth.

Although, on the other hand, some slight non-benevolence could be useful for promoting new projects.

I tried to test my model empirically based on the data from the annual balance sheets of Russian enterprises. Basically, the empirical results confirm the theoretical ones (though with some qualifications). The most important inconsistency between the theory and the real data concerns the dependence of privileges on the efficiency of production. According to the presented model, the dependence must be positive whereas there is empirical evidence of negative dependence (this is not a new result; see, for example, Ponomareva, Zhuravskaya, 2000). Perhaps, such discrepancy occurs because in the present paper, only the economic aspect of patronage is taken into consideration. However, social and political factors may have opposite effect. For example, sometimes it turns out to be inevitable that the government supports an inefficient and unprofitable "town-forming" enterprise with a large number of workers who would get unemployed or unpaid otherwise (empirical observations show that productivity is negatively correlated with the number of workers). Papers by Qian, Roland (1998) and Shleifer, Vishny (1994) yield examples of models in which production efficiency and privileges would be negatively dependent.

The paper is organized as follows. Section 2 contains a review of the related literature. The theoretical part of the paper (sections 3–6) is basically devoted to proving the above-mentioned results. In section 7, some concluding remarks are given. In the appendix, proofs of some statements are provided.

2. REVIEW OF LITERATURE

There are a number of domestic and foreign publications on the issues of our interest. Here I mainly focus on the literature concerning the relations between the authorities and businesses, vertical control and fiscal federalism.

The central topic of our discussion is the inefficiency of interactions between firms and non-benevolent authorities. In this context, the government can be treated as a provider supplying private producers with some specific intermediate goods. Here I consider two groups of such goods. Goods of the first group are private and they are called "privileges". Privileges include tax reductions, subsidies, exclusive contracts and other forms of special treatment. The second group includes public goods such as infrastructure, judicial system, etc. Payments for these intermediate goods can be implemented by various tariffs and taxation schemes.

So, the policy of regional authorities may be represented as a contract with producers for the delivery of intermediate goods. The authority behaves as a monopolist exercising control over other participants in the market. Generally, this concept describes a broad class of vertical relations (see, e. g., Hart, Tirole, 1990; Tirole, 1988). However, my approach has two important features which are peculiar to the relations between politicians and firms and are absent in the standard vertical integration framework that studies the behavior of firms only. Firstly, the local authority is able not only to allocate private intermediate goods among some firms, it can also provide (or underprovide) public goods for the whole regional economy. The tradeoff between private and public provision of the same resources has not been studied in the context of vertical restraints. Secondly, unlike the firm exercising purely economic vertical control, the authority may be interested in maximizing not only its own revenues but also the wealth of consumers and producers. So to say, I am going to present a spectrum of models within one, with a model of welfare economics at the left edge and a model of vertical control at the right one.

Contracts with politicians form the base of the models of influential behavior that are closely related to our subject. There are a number of papers on lobbying and influence activities (e. g., Felli, Merlo, 2000; Grossman, Helpman, 1994; Jehiel, Thisse, 2000). Grossman and Helpman (1994) endogenize lobbying as a set of contracts between the government and firms, which is quite near to what is done here. Unlike the present paper, these contracts take the form of menu auctions (see Bernheim, Whinston (1986) for reference), so optimal contracts are designed by lobbying agents rather than by the government. This affects the distribution of rents, which are mostly appropriated by agents.

Studying rent-seeking contracts was the subject of the author's master thesis (Tonis, 1998). In that paper, as in the present one, the authority (bureaucrat) designs a set of contracts with producers; in one of the versions of the model, producers get from the bureaucrat some additional production input (what is called here a "special resource"). The purpose was to endogenize the technology of influence, i. e., derive it from the "first principles." In some sense, the present paper can be treated as a continuation of that one, although now I pursue a wider aim: to reveal policy distortions occurring in systems involved in influential activity rather than just evaluate the price of the share of the pie.

To finish with the theme of vertical relations, let us note that contracts between regional politicians and firms are not the only form of vertical control in a federal state. If there are several levels of government, vertical

externalities between these levels occur because the private sector response to policy decisions in one level affects the payoffs in another. Boadway and Keen (1998) and Keen (1998) study these and related issues.

As it has been already said, one of the most serious sources of inefficiency is insufficient provision of public goods by a non-benevolent government. The latter behaves just as the autocrat in the well-known paper of McGuire and Olson (1996): it provides some public goods just to have something to rob afterwards. Another reason for such policy may be to increase the demand for patronage: firms try to get rescue from the unfavorable economic conditions under the wing of the state. In other words, privileges become an instrument of fiscal protection (as in Treisman, 1999), the only difference being that the government "protects" firms from itself, first by creating bad conditions and then by offering privileges which can partly help firms overcome these purposely created problems.

The situation may become much more unpleasant if there is more than one "bandit" seeking the same rent, so the "tragedy of commons" takes place. This case is described by Berkowitz and Li (1997). According to the authors, one of the causes of economic decline is the existence of several independent tax agencies exhausting the same tax base.

There is another form of losses arising from the regional government's bad policy that is not captured here, namely, bad reputation. In a federal state, any case of predatory behavior by the local authorities can affect the reputation of the region and thus deprive it of investment resources, which will be redirected to other regions. However, as the authors of a number of papers on fiscal federalism insist (e. g., Qian, Roland, 1998; Kolomak, Kokovin, 1999), this negative effect may lead to a positive shift in the regional policy. Namely, under inelastic supply of mobile resources in the federation, competition among regions for resources may arise, which can discipline regional administrations.

In the model presented here, the government can control only the conditions in which firms work. The efficiency losses are more dramatic if politicians can influence the producer's strategy as in the classical model suggested by Shleifer and Vishny (1994). In this model, the politician and the firm manager bargain over what the firm must do. They collude to employ excess labor, which results in mutually profitable but economically inefficient allocation of resources. Note that less efficient firms are likely to get more subsidies under such circumstances (contradictory to my model); the same thing takes place under a soft budget constraint (see Qian, Roland, 1998). As a result, a trap is generated: inefficient firms continue to exist and to be inefficient.

All the above-mentioned papers present what great theoretic economists think on the issues. It would be interesting to know the opinion of the participants of the game themselves. A large sociological investigation among businessmen concerning the relations between authorities and the private sector and the business ethics has been done by Radaev (1998). According to his results, a considerable part of the respondents (50%) find it impossible to get rid of illegal deals between entrepreneurs and bureaucrats; a smaller percentage of them have been really involved in such deals.

An interesting insight into patronage relations in Russia was suggested by Vorobiev (1999). The author studies specific features of the Russian market and management. According to his terminology, the Russian market area consists of "parastate" and "the proper market," with an intermediate layer of those who have not decided yet where to go. Managers of the proper market operate under the usual rules of a market economy. Managers working in the parastate must be able to perform an additional management function: interact with the state and attain privileges. The observation the author makes is that despite that the proper market sector is growing in modern Russia, it is still too thin and weak, so managers with the additional influence function will be demanded for a long time.

3. BASIC MODEL

To study the above issues, I set up a model of patronage. In this section, I am going to give a general description of the model.

The economy of the region is treated as an industry which consists of n firms ($n \geq 2$) producing the same good and involved in Cournot quantity competition. In the symmetric model considered in the next section, firms are supposed to be identical; then I am going to consider more general versions of the model with heterogeneous firms differing in scale and efficiency.

The economy is regulated by an authority (government), which can affect the performance and incentives of firms. The government interference results in a decrease or increase in a firm's per-unit (or marginal) cost. If the firm's cost is lowered by the government (in an individual way), let us say that this firm is *patronized* or *privileged*. If a firm becomes privileged, it gets an advantage over other firms in the subsequent market competition. Thus, privileges can raise the firm's profit, so the firm is willing to pay

or do something in return or to struggle with other firms for the state's patronage.

The key feature of the present model is that the government regulation is endogenized: there is a market for privileges. A firm can "buy" privileges for some "payment" (treated in a broad sense, i. e., not necessarily in the monetary form); the government, in turn, sets the "price" of privileges according to its preferences, taking into account the incentives of producers.

Note that from the producers' point of view, a very broad range of situations can be described by this setting, i. e., they are equivalent to getting a marginal cost reduction in exchange for a fixed compensation. Let us give a few examples:

• **Subsidies.** Firms are competing for government subsidies. To get a per-unit subsidy, the firm is ready to spend some amount for struggling or for bribes.

• **Licensing.** The government provides firms with some exclusive inputs such as licenses. A license requires a fixed payment to the government and allows producers to avoid fines and other penalties for not having a license. A firm faces the risk of being fined every time it produces a unit of output, so the license reduces its marginal cost. Registered trademarks generate similar incentives.

• **Tax privileges.** This form of privileges is equivalent to subsidies. Firms may undertake some activities (for example, participate in charitable actions) just to reduce the taxes they pay.

• **Lobbying.** A firm makes efforts in order to lobby for a law or resolution (e. g., concerning export or import tariffs) from which it can benefit. This example differs from the above ones because the lobbying firm exerts an externality, i. e., it affects the profits of other firms. This externality may cause feedback through the market price, so the equilibrium behavior in this case is likely to be different from what can be derived for the three above examples.

• **Government projects.** The government is going to carry out some project and employs a firm to do it. As can be shown (see appendix), under linear demand, this situation is totally equivalent to examples 1–3.

One should note that although almost all of these examples are equivalent (or, at least, nearly equivalent) from the producer's point of view, some of them may be substantially different from the authority's point of view. For instance, it matters for the authority whether the firm's expenditures are bribes or losses incurred from its struggle.

Each case of patronage requires an individual transaction with a firm. These transactions (sometimes informal or even illegal) are costly. To capture this issue, let us suppose that the government regulation may take one of two forms. Firstly, as it has been said, the government can treat firms individually, i. e., patronize some firms by giving them privileges and discriminate against others by giving them less or even nothing. Secondly, the government can support (or suppress) all firms at the same moment by providing public goods or infrastructure, reducing taxes, etc. (or, on the contrary, imposing bureaucratic barriers, new taxes, etc.). A policy of this kind will be referred to here as *general regulation policy*. Its key feature is that unlike patronage, it affects all firms to the same extent. Suppose now that the government is planning to reduce the per-unit costs of all firms by the same amount. This action can be done in two ways: through patronage or through general regulation policy. One of the key assumptions of my model is that the first way is more expensive to implement than the second one.

Thus, patronage is costly for society (at least, when it does not lead to discrimination which sometimes may be beneficial). On the other hand, it can be attractive for the government because it involves side transfers, which are appropriated by government bureaucrats. I try to capture this discrepancy in the model.

Now let me describe the model more formally. The interaction between the government and firms is treated as a three-stage dynamic game. At the first stage, the authority forms its general regulation policy and declares the terms by which privileges can be gained. At the second stage, firms decide whether to seek privileges. At the third stage, firms choose their production strategies and play the Cournot oligopoly game.

In accordance with the standard way of analyzing dynamic games, I will look for the subgame-perfect Nash equilibrium proceeding backward, from the last stage to the first one.

Let us start with the last stage of the game, quantity competition. There are n firms in the economy. The production technology of firm i is given by its cost function $C_i(y)$. This cost function is the total of all production expenditures including taxes.[1] In sections 4 and 5, all cost functions are supposed to be linear: $C_i(y) = c_i y$; then I am going to consider nonlinear cost functions in order to capture the notion of the "large firm" and study the "scale effect." Firms compete in quantity as in the standard Cournot framework. The demand for output is given by the inverse

[1]Provided that taxes are levied per unit of real output rather than per unit of sales.

demand function $p(Y)$, where Y is the total output of the economy. I assume for simplicity that the demand is linear and choose the units of output and prices so that $p(Y) = 1 - Y$.

In the presence of the government regulation, the cost actually incurred by firm i may differ from $C_i(y)$. In order to define how the firm's costs depend on government intervention, let us introduce a set of policy parameters $(s, g) = (s_1, \ldots, s_n, g)$, which means that firm i gets privileges equivalent to the subsidy of s_i per unit of output (s_i is always non-negative) and the general regulation policy is equivalent to giving all firms the subsidy of g per unit of output (g can be negative[2]). If $g > 0$, the policy is supportive (the government provides public goods or lowers taxes). However, g can be negative, in which case the policy exerts an oppressive impact on the economy. Under policy (s, g), the actual cost function of firm i is given by

$$\tilde{C}_i(y) = C_i(y) - (s_i + g)y. \tag{3.1}$$

As in the usual Cournot model, firm i chooses its production strategy y_i so as to maximize its profit given that the outputs of the other firms are fixed. The firm's optimization problem is

$$\Pi_i = p(Y)y - \tilde{C}_i(y) \to \max_y. \tag{3.2}$$

Given the cost functions determined by (3.1), one can solve problem (3.2) for each firm and find the Cournot equilibrium.[3] Let us denote by $y_i = y_i(s, g)$, the equilibrium output of firm i under the given set of policy variables $(s, g) = (s_1, \ldots, s_n, g)$ and by $\Pi_i = \Pi_i(s, g)$, the corresponding profit.

Now let us turn to the second stage of the game. At this stage, producers form their attitude towards privileges and decide whether to accept patronage. I assume here that the government is able to distinguish

[2]If the words "negative amount of public good" sound uncomfortable, then g can be thought of as a deviation from some standard level, which requires no special expenditures from the regional budget.

[3]When solving for the Cournot equilibrium, I make an implicit assumption that all actual cost functions $\tilde{C}_i(y)$ are common knowledge; in particular, everyone can observe the privileges of others. This assumption might seem debatable. However, if n is sufficiently large, the impact of the knowledge about the actual costs of one firm on the strategy of another is insignificant; only aggregates matter. The assumption about observable aggregates (even concerning privileges) is quite natural.

between firms,[4] so firm i cannot choose the patronage scheme assigned for firm j, $j \neq i$. Hence, firm i has two opportunities: get privileges (produce at actual cost $\tilde{C}_i(y)$) and pay h_i or reject patronage (produce at actual cost $\tilde{C}_i(y) + s_i y$) and pay nothing. Some share of h_i may be dissipated as a sunk cost (since privileges increase the profit of the firm, it may be ready to struggle for privileges and any struggle is costly); the rest is paid to the government. I assume for simplicity that there are no sunk costs and all of h_i is paid to the government.[5] In any case, patronage will be accepted if

$$\Delta_i \stackrel{\text{def}}{=} \Pi_i - \Pi_i' \geq h_i, \tag{3.3}$$

where $\Pi_i' = \Pi_i(s', g)$, $s' = (s_1, \ldots, s_{i-1}, 0, s_{i+1}, \ldots, s_n)$. Condition (3.3) is the participation constraint. It determines the ceiling for the amount that firm i has to pay for privileges. If there are no other constraints such as incentive compatibility (see footnote 4) and the government is interested in more revenue, it will set h_i at the maximal level given by the left-hand side of (3.3).

Now let us describe the first stage of the game. At this stage, the authority forms its policy, i. e., chooses $n + 1$ policy parameters, $s_1, \ldots, s_n$ and g (according to what has been said above, h_i is actually not a free variable, it is set equal to Δ_i, $i = 1, \ldots, n$). The authority tries to choose (s, g) in the "best" way (in some sense), i. e., based on some preferences. I am going to consider two types of authorities that will be called "mercenary" and "benevolent." The mercenary authority is concerned about government revenues only while the benevolent authority is concerned about social welfare. Besides these two polar cases, governments with some interim preferences will be considered.

Formally, the government chooses (s, g) so as to maximize its objective function. If the government is benevolent, it tries to maximize social welfare which is the sum of three components:

$$W = G + \Pi' + CS, \tag{3.4}$$

[4]If the government cannot distinguish between firms, it has to take this into account when choosing its policy. Technically, this means that the set of possible actions of the government is additionally restricted by incentive compatibility constraints, due to which firms exhibiting high demand for privileges get information rent. The government's policy optimization problem gets much more complicated in this case (at least, when the scale effect is present, see section 6). Numerical examples show that the most principal qualitative results obtained in this paper are valid for the case of asymmetric information too.

[5]In fact, possible sunk costs of struggle (rent dissipation) as well as transaction costs can be taken into account in the government objective function (see below).

where G is the total government revenue (net of government expenditures), Π' is the total producer profit net of expenditures for patronage and CS is the total consumer surplus.

If the government is non-benevolent, it may use its funds for aims other than increasing welfare. For example, some budget resources may be diverted for the private or political interests of officeholders or lobbies. For this reason, a non-benevolent government values its revenues more than the other two components of the welfare function (3.4). To capture this fact, I consider here the following government objective function (cf Grossman, Helpman, 1994):

$$V = G + (1-\mu)(\Pi' + CS) = W - \mu(\Pi' + CS), \tag{3.5}$$

where $\mu \in [0,1]$ is the government's "rate of predation" distorting the welfare function. The benevolent authority is represented by $\mu = 0$ and the mercenary one by $\mu = 1$.

Net government revenue G is the total of payments collected from firms net of spendings on privileges and public goods.[6] It is given by

$$G = \sum_{i=1}^{n} \big\{ h_i - \big[(1+\theta)s_i + g\big] y_i \big\}. \tag{3.6}$$

where $\theta > 0$. Thus, the government expenditures are calculated as if the government paid subsidies to the firms; as stated before, patronage contracts entail transaction costs which are represented by θ, the losses per unit of output.

The total net profit Π' is given by

$$\Pi' = \sum_{i=1}^{n} \Pi'_i = \sum_{i=1}^{n} (\Pi_i - h_i)\,. \tag{3.7}$$

Under the chosen linear demand function, the consumer surplus is given by

$$CS = \frac{Y^2}{2}. \tag{3.8}$$

[6] I leave out of the scope of study the issue of balancing the government budget. It is assumed that the necessary taxation has been made for that purpose (the tax expenditures are included in the producers' costs).

Combining (3.5)–(3.8), we obtain

$$V = W - \mu\left(\sum_{i=1}^{n} \Pi_i' + \frac{Y^2}{2}\right), \tag{3.9}$$

where

$$W = \sum_{i=1}^{n} \left[\Pi_i - (1+\theta)s_i y_i\right] - gY + \frac{Y^2}{2} \tag{3.10}$$

is the objective function of the benevolent government.

Thereby, the general scheme of the model is described. In the subsequent sections, some important special cases of the model are analyzed and conclusions are drawn.

4. SYMMETRIC CASE
GOVERNMENT LIKES TO PATRONIZE

In this section, I consider a simple special case of the model in which firms are identical and their cost functions are linear: $C_i(y) = cy$, where $c \in [0, 1]$ is a constant. The key result obtained here is that despite the fact that patronage is socially costly, it is preferable for the government if the government is not benevolent.

As follows from the strict concavity of the government objective function (see appendix), the government does not discriminate among identical firms. So, s_i does not depend on i at the optimum: $s_i = s$ for all i. According to (3.1), the actual cost incurred by the firm is $\tilde{C}(y) = \tilde{c}\,y$, where

$$\tilde{c} = c - s - g. \tag{4.1}$$

The first-order condition for the profit maximization problem takes the form

$$y = p - \tilde{c}, \tag{4.2}$$

where due to symmetry $p = 1 - ny$. From (4.2), one can obtain the equilibrium output and profit of the firm:

$$y = \frac{1 - c + s + g}{n+1}, \tag{4.3}$$

$$\Pi = y^2. \tag{4.4}$$

In order to obtain h, the payment for the privilege, which is equal to the rent gained from it, one should calculate y' and Π', the hypothetical output and profit of the firm as if it rejected privileges whereas the others accepted. Provided that $y' > 0$, the equilibrium production strategy for this case is given by

$$y' = y - s + \Delta p, \tag{4.5}$$

where Δp is the increase in the market price caused by rejecting privileges. Is is easy to show that

$$\Delta p = \frac{s}{n+1}. \tag{4.6}$$

Thus, combining (4.5) and (4.6), we obtain

$$y' = y - \nu s, \quad \nu \stackrel{\text{def}}{=} \frac{n}{n+1}. \tag{4.7}$$

The corresponding profit Π' is given by

$$\Pi' = y'^2. \tag{4.8}$$

Hence, the amount the firm pays for privileges is

$$h = y^2 - y'^2 = \nu s(2y - \nu s). \tag{4.9}$$

Substituting (4.3)–(4.9) into (3.9) and (3.10), we obtain

$$W = \nu y\left[\left(\frac{n}{2}+1\right)(1-c) - \left(\frac{1}{2}+\lambda\right)ns - \frac{1}{2}ng\right], \tag{4.10}$$

$$V = W + n(y - \nu s)^2 + \frac{n^2y^2}{2}, \tag{4.11}$$

Here $\lambda \stackrel{\text{def}}{=} \theta/\nu$. For technical reasons, I will refer to the transaction cost parameter in terms of λ instead of θ in the subsequent computations. For high n, the difference between λ and θ is small.

The government chooses (s, g) so as to maximize V subject to $s \geq 0$. The corresponding equilibrium may be characterized by the following proposition:

Proposition 1. *Suppose that the per-unit transaction costs of patronage are not very high* ($\lambda \ll 1$). *Then the equilibrium* (s, g, y) *has the following properties*:

1) *An absolutely benevolent government (with $\mu = 0$) implements no patronage and follows supportive general regulation policy (provides good infrastructure or reduces taxes).*

2) *An absolutely mercenary government (with $\mu = 1$) always implements some patronage and follows suppressive general regulation policy (does not care about infrastructure or imposes new local taxes).*

3) *The level of patronage activity s is non-monotone in μ : it is non-decreasing for low μ, decreasing for high μ and reaches its maximum at some $\hat{\mu} \in (0, 1)$.*

4) *Public goods g and output y negatively depend on μ.*

Proof. Using (4.10) and (4.11), one can derive the first-order conditions for the policy optimization problem. We obtain the following equilibrium:

$$s = \begin{cases} (1-c)\dfrac{\mu - \lambda/2}{\nu q} & \text{if} \quad \mu > \lambda/2; \\ 0 & \text{if} \quad \mu \le \lambda/2; \end{cases} \tag{4.12}$$

$$g = \begin{cases} (1-c)\left(\dfrac{\mu(n-1) + \lambda/2}{\nu q} - 1\right) & \text{if} \quad \mu > \lambda/2; \\ (1-c)\left(\dfrac{n+1}{n(1+\mu) + 2\mu} - 1\right) & \text{if} \quad \mu \le \lambda/2; \end{cases} \tag{4.13}$$

$$y = \begin{cases} (1-c)\dfrac{\mu}{q} & \text{if} \quad \mu > \lambda/2; \\ \dfrac{1-c}{n(1+\mu) + 2\mu} & \text{if} \quad \mu \le \lambda/2. \end{cases} \tag{4.14}$$

Here $q = \mu(n(1+\mu) + 2\lambda) - \lambda^2/2$. It is easy to check that if $\mu > \lambda/2$, then the denominator q is positive. Note that q is the determinant of the Hessian of V (up to a positive constant multiplier). Since V is concave in s and $q > 0$, the second-order conditions hold in the equilibrium for $\mu > \lambda/2$. For lower μ, they hold too because V is concave in g.

Another thing to be checked is the positiveness of y' (otherwise, the above formulas would not be valid because the rent of privileges would be overestimated):

$$y' = y - \nu s = \frac{\lambda(1-c)}{2q} > 0. \tag{4.15}$$

If $\mu = 0$, then $\mu \leq \lambda/2$, so the equilibrium under the benevolent government is given by

$$\begin{aligned} s &= 0, \\ g &= \frac{1-c}{n} > 0, \\ y &= \frac{1-c}{n}, \end{aligned} \tag{4.16}$$

and statement 1 of Proposition 1 holds.

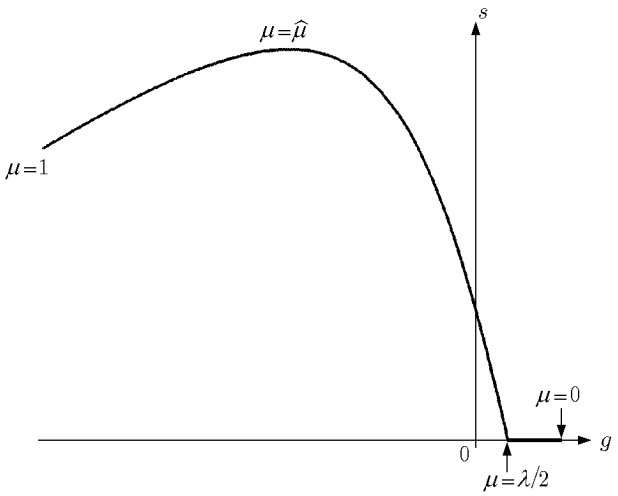

Fig. 4.1. Government policy (s, g) for various μ

If $\mu = 1$, then $\mu > \lambda/2$ (provided that $\lambda < 2$), so the equilibrium under the mercenary government is given by

$$\begin{aligned} s &= (1-c)\frac{2-\lambda}{\nu(4(n+\lambda)-\lambda^2)} > 0, \\ g &= -(1-c)\frac{2n+\lambda(3-\lambda)+(2-\lambda)/n}{4(n+\lambda)-\lambda^2} < 0, \\ y &= (1-c)\frac{2}{4(n+\lambda)-\lambda^2}, \end{aligned} \tag{4.17}$$

which proves statement 2 of Proposition 1.

To prove statements 3 and 4, note that the right-hand sides of (4.13) and (4.14) are always decreasing in μ. As for the right-hand side of (4.12), its first partial derivative $\frac{\partial s}{\partial \mu}$ is positive at $\mu = \lambda/2$; at $\mu = 1$, it is proportional to $3\lambda n + \lambda^2 - 2n$, which is negative if $\lambda < \bar{\lambda}$ ($\bar{\lambda} \approx 0.6$). Hence, there exists $\mu = \hat{\mu}$, which yields a local maximum to s and since $\frac{\partial s}{\partial \mu}$ cannot change its sign more than twice as μ proceeds from $\lambda/2$ to 1, this local maximum is global. This is just what we need to prove. $\square$

One can see from Proposition 1 that the benevolent government prefers to support firms publicly while the mercenary one prefers to do it privately. This happens because patronage yields direct benefits to the authorities (actually, to the bureaucrats) whereas the costs of bad policy rest on producers and consumers and are not taken into account by the mercenary government. On the contrary, the benevolent government does not carry out patronage because this costly measure could be socially beneficial only if some discrimination were needed, which is not the case when the firms are identical.

The result concerning the general regulation policy is also intuitively clear: a mercenary government does not enjoy the whole benefit of public goods but only their impact on the privilege rent, so it is not highly interested in providing public goods.

There is one important detail, however: despite the benefits of patronage, s is decreasing in μ for high μ. A possible intuitive explanation of this non-monotonicity may be the following: if the government cares much about its revenues, the oppressive effect of its general regulation is so strong that the rents from patronage activity cannot be high and, hence, there is no sense in giving firms many privileges.

The following proposition shows how λ, the rate of social cost of patronage, affects the patronage activity, general regulation policy and total output.

Proposition 2. *Suppose that firms get some privileges (i. e., $\mu > \lambda/2$). Then equilibrium (4.12)–(4.14) exhibits the following dependence on the social cost of patronage*:

1) *privileges and output are decreasing in λ*;

2) *for low μ ($\mu \leq \breve{\mu}$), g is increasing in λ; for higher μ, g is non-monotone: it reaches its minimum at some $\lambda \in (0, 2\mu)$.*

Proof. It can be checked that $\frac{\partial s}{\partial \lambda} < 0$ and $\frac{\partial y}{\partial \lambda} < 0$ (both inequalities are intuitively clear: a higher cost of patronage implies lower patronage activity, and because this cost is implicitly added to the production costs, the production activity becomes lower too). So, the first statement is proved. Let us turn to the second one. We have

$$\frac{\partial g}{\partial \lambda} = (1-c)\frac{(1-3\mu+2\lambda)\mu n + 4\mu^2 - 2\lambda\mu + \lambda^2/2}{2\nu q^2}. \tag{4.18}$$

If $\lambda = 2\mu$, then $\frac{\partial g}{\partial \lambda} = \frac{1-c}{2\nu q} > 0$. On the other hand, if $\lambda = 0$, then $\frac{\partial g}{\partial \lambda}$ is proportional to $n - \mu(3n-4)$. Hence, if $\mu \leq \breve{\mu} = \frac{n}{3n-4}$, then g is increasing in λ whereas if $\mu > \breve{\mu}$, then g is non-monotone (decreasing at low λ). Q. E. D. $\square$

Proposition 2 yields the following policy implication: if the regional legislative body or the central authority tries to reduce the abuse of patronage by directly penalizing those who distributes privileges[7] (increasing λ), this "benevolently intended" policy leads to a negative result: the regional government will not compensate the decreased amount of privileges by an equivalent improvement of the general regulation policy. Moreover, if μ is large, the government will even reinforce the fiscal and bureaucratic burden over the producers to cover the increased expenditures on patronage. Any other changes which directly or implicitly increase the "effective λ" will lead to the same problems. For example (although it may look paradoxically), an increase in the bargaining power of firms negotiating with politicians[8] leads to a decrease in their output.

In fact, there are two interconnected problems caused by the lack of benevolence of the regional government: inefficiency of supporting producers privately rather than publicly and, which is more serious, underprovision of this support at all. One way to solve this problem is to centralize (to some extent) the provision of public goods, i. e., free the regional government of some share of expenditures on them. As regards the regional government's revenues, such central policy is equivalent to a decrease in firms' marginal costs. Hence, the amount of public goods will go up, but the level of the patronage activity will go up too, which will be an indirect cost of the returned public goods.

[7] Or receives: the result will be analogous.
[8] In the present model, the authority enjoys 100% of the bargaining power.

5. PRIVILEGES AS A TOOL OF DISCRIMINATION

In this section, I incorporate asymmetry into the model to study how firms can be discriminated by their productivity. The main result here is that if the government is non-benevolent, it is likely to discriminate among firms too much suppressing inefficient producers more heavily than at the socially optimal solution. Only firms with (relatively) very low costs may gain from such a policy.

Let us consider the following special case of the setting introduced in section 3. The economy consists of $n = n_1 + n_2$ firms with linear costs. There are two types of firms which are called "efficient" and "inefficient"; n_1 firms are efficient and n_2 are inefficient. The cost functions of the efficient and inefficient firms are, respectively, $C_1(y) = c_1 y$ and $C_2(y) = c_2 y$, where $c_1 < c_2$.

Let us denote by

$$\bar{c} \stackrel{\text{def}}{=} \frac{n_1 c_1 + n_2 c_2}{n}$$

the average per-unit cost in the economy and by

$$d \stackrel{\text{def}}{=} c_2 - c_1,$$

the efficiency gap between the two types.

Due to the strict concavity of the government objective function (see appendix), there is no need to discriminate among identical firms. So, the government policy is given by three parameters: s_1 (the privilege of efficient firms), s_2 (the privilege of inefficient firms) and g (the general regulation policy). The interior Cournot equilibrium[9] is then given by

$$\begin{aligned} y_1 &= \frac{1 - (n_2 + 1)(c_1 - s_1) + n_2(c_2 - s_2) + g}{n + 1}, \\ y_2 &= \frac{1 - (n_1 + 1)(c_2 - s_2) + n_1(c_1 - s_1) + g}{n + 1}. \end{aligned} \tag{5.1}$$

As before, the profit of each firm is given by

$$\Pi_i = y_i^2. \tag{5.2}$$

[9] I look for an equilibrium with $y_1 > 0$ and $y_2 > 0$. Otherwise, there is no sense in considering the asymmetric model.

The output of a firm rejecting privileges is given by

$$y_i' = \max(y_i - \nu s_i, 0). \tag{5.3}$$

Hence, the rent from privileges is

$$h_i = \begin{cases} y_i^2 - y_i'^2 = \nu s_i(2y_i - \nu s_i), & \text{if} \quad y_i > \nu s_i; \\ y_i^2, & \text{if} \quad y_i \le \nu s_i. \end{cases} \tag{5.4}$$

Note that the way of calculating the rent h_i depends on the positiveness of y_i'. As we shall see, the accuracy is needed at this point because y_2' may be zero in equilibrium.

The following proposition shows how the policy of the regional government depends on its benevolence.

Proposition 3. *Suppose that λ is not too high ($\lambda < 1/2$). Then in equilibrium, the government policy (s_1, s_2, g) has the following properties*:

1) *an absolutely benevolent government (with $\mu = 0$) either patronizes efficient firms only or does not give privileges at all (so, $s_2 = 0$ in any case)*;

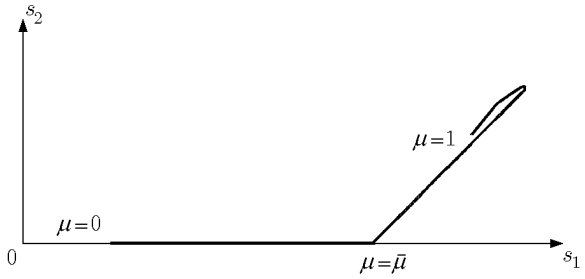

Fig. 5.1. Privilege policy (s_1, s_2) for various μ

2) *an absolutely mercenary government (with $\mu = 1$) always gives some privileges to efficient firms and maybe even to inefficient ones*;

3) *efficient firms always enjoy as many as or more privileges than inefficient ones*;

4) *the level of discrimination* $\Delta s \stackrel{\text{def}}{=} s_1 - s_2$ *is higher for a non-benevolent government than for a benevolent one* (*see Figure* 5.2);

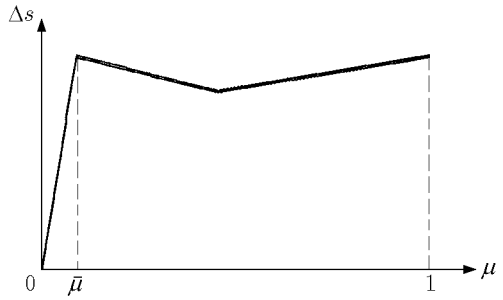

Fig. 5.2. Level of discrimination as a function μ

5) *the output of efficient firms may be non-monotone in* μ, *but the output of inefficient ones as well as the total output of the economy always falls as the government becomes less benevolent* (*see Figure* 5.3);

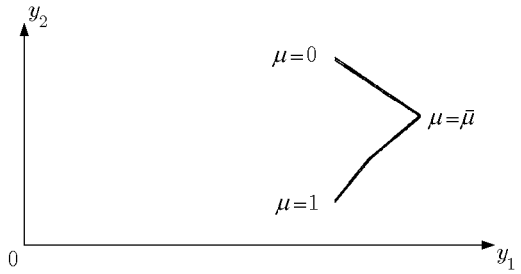

Fig. 5.3. Equilibrium outputs (y_1, y_2) for various μ

Proof. Suppose that inefficient firms have positive net profit, i. e., $y_2' > 0$. Maximizing the authority's objective function (3.5), we obtain the following interior equilibrium ($s_1 > 0$, $s_2 > 0$):

$$s_1 = \bar{s} + \frac{(1-\lambda)n + 1 - 2\mu}{2(\lambda n(n+1) + \mu)} \frac{n_2}{n} d, \tag{5.5}$$

$$s_2 = \bar{s} - \frac{(1-\lambda)n + 1 - 2\mu}{2(\lambda n(n+1) + \mu)} \frac{n_1}{n} d, \tag{5.6}$$

$$g = \bar{g}, \tag{5.7}$$

$$y_1 = \bar{y} + \frac{(n+1)^2 + \lambda n(n+1) - 2\mu n}{2(\lambda n(n+1) + \mu)} \frac{n_2}{n} d, \tag{5.8}$$

$$y_2 = \bar{y} - \frac{(n+1)^2 + \lambda n(n+1) - 2\mu n}{2(\lambda n(n+1) + \mu)} \frac{n_1}{n} d, \tag{5.9}$$

where $(\bar{s}, \bar{g}, \bar{y})$ is the symmetric equilibrium (4.12)–(4.14) for $c = \bar{c}$. The equilibrium (s_1, s_2, g, y_1, y_2) cannot be interior (and formulas (5.5)–(5.9) are not valid) if the symmetric one $(\bar{s}, \bar{g}, \bar{y})$ is not interior, i. e., if $\bar{s} = 0$.

It can be checked that if the equilibrium is not interior, then $s_2 = 0$. At the same time, if $\mu = 0$, then due to Proposition (1), there cannot be an interior symmetric equilibrium $(\bar{s}, \bar{g}, \bar{y})$, which means that our equilibrium is not interior as well. Hence, $s_2 = 0$ for $\mu = 0$. As for s_1, it is given by

$$s_1 = \frac{\max\left\{-\lambda n(1-\bar{c}) + \left[(1-\lambda)n + 1\right)n_2 d\right], 0\right\}}{\nu\lambda\left[2n_2(n+1) - \lambda n_1\right]}. \tag{5.10}$$

Thus, the equilibrium is not interior for low μ. If there is an interior equilibrium for some μ, then there exists $\mu = \bar{\mu}$, which is the boundary point between the two types of equilibria. But because of the non-monotonicity of s_i with respect to μ, it is possible (in principle) that $s_2 = 0$ for some high μ ($\mu \gg \bar{\mu}$). It is also possible that there is no interior equilibrium for any μ.

Now suppose that $\mu = 1$. If $s_2 > 0$, then $s_1 > 0$, and the equilibrium is given by (5.5)–(5.9). Otherwise, if $s_2 = 0$, s_1 is given by

$$s_1 = \frac{(n+1)\left\{(2-\lambda)n^2(1-c) + 2(n+1)\left[(1-\lambda)n - 1\right]n_2 d\right\}}{(4n + 4\lambda - \lambda^2)n_1 n^2 + 4(n+1)\left[\lambda n(n+1) + 1\right]n_2}. \tag{5.11}$$

Thus, $s_1 > 0$ in any case under $\mu = 1$.

Now consider the level of discrimination Δs. If the equilibrium is interior, Δs is given by

$$\Delta s = \frac{(1-\lambda)n + 1 - 2\mu}{2(\lambda n(n+1) + \mu)}. \tag{5.12}$$

As follows from (5.12), Δs is slightly decreasing in μ; for high n, it is almost constant. But this is so only for interior equilibria. As can be shown, if $\mu < \bar{\mu}$, then $\Delta s = s_1$ is rapidly increasing in μ. So, Δs is higher for high μ (including $\mu = 1$) than for $\mu = 0$ though it is non-monotone in μ. Note also that in any case, $\Delta s \geq 0$. Thereby, statements 3 and 4 are proved.

Since s_1 is rapidly increasing for $\mu < \bar{\mu}$ while $s_2 = 0$, y_1 may be increasing in μ for $\mu < \bar{\mu}$ despite the worsening general regulation policy (see Figure 5.3). If the equilibrium is interior, then, as follows from (5.8)–(5.9), both y_1 and y_2 are decreasing in μ.

To complete the proof, let us say a few words about the case where inefficient firms have no profit (i. e., $y_2' = 0$, which is possible only in an interior equilibrium with $s_2 > 0$). The rent of an inefficient firm appropriated by the authority is then higher than in (5.4) and, as can be checked, in equilibrium, s_1, s_2 and Δs are higher than in (5.5), (5.6) and (5.12), respectively. Hence, the main qualitative results remain the same. □

The main message of Proposition 3 is that a non-benevolent government is likely to discriminate among firms too much leaving inefficient ones no chance to act on equal terms with others even if the efficiency gap is small. The market competition gets much more severe under such privilege policy; success in the game may be determined by slight random factors. On the one hand, such tight competition may be useful and can stimulate innovations and investment in quality. But on the other hand, the small number of potential winners in the game may result in higher concentration of the industry (up to monopolization).

Of course, sometimes discrimination is socially desirable. Formula (5.10) implies that efficient firms get privileges from the benevolent government if the efficiency gap d is sufficiently high; otherwise, there is no need to discriminate. On the contrary, a mercenary government always discriminates among firms.

It is necessary to make one important remark. The statement about the positive dependence of the amount of privileges on efficiency seems to be disputable. Moreover, there is empirical evidence in favor of the opposite hypothesis. As it has been already said, a possible explanation of such discrepancy is that in the present paper, only the economic aspect of patronage is studied whereas social and political factors are not considered. This is a restriction of the applicability of the above results. Probably, Proposition 3 might be applicable for diversified industries (represented by many enterprises in the region), in which the political influence of each separate firm is not very strong and only economic issues matter.

6. SCALE EFFECT
WHY THE GOVERNMENT SUPPORTS LARGE FIRMS?

In this section, I incorporate the issue of *scale* into the model. Firms now may differ not only in their productivity, they can also have different initial stocks of capital. A firm with higher initial capital turns out to be less sensitive to changes in the economic environment, in particular, in government regulations. This is called here *the scale effect*. The purpose of this section is to study how the scale effect affects the distribution of privileges among firms and how the latter depends on the interests of the government. I am going to show that a mercenary government (compared to a more benevolent one) is likely to give relatively more advantages to large (insensitive) firms.

How to incorporate the scale effect into the model? Suppose that there are two firms that are technologically identical but one firm is initially endowed with some amount of capital and the other is not (let us call them, respectively, the large and the small firm). It is obvious that the large firm can produce at lower marginal costs than the small one as long as the output does not exceed the initial capacity of the large firm. Otherwise, both firms have to invest in increasing their capacity before production, so their marginal costs are equal.

Thus, the notion of scale can be incorporated into the model by a proper choice of cost functions. The most straightforward approach (suggested by Dixit, 1980) is to consider step marginal cost functions.[10] Here I am going to use a more "smooth" approach. Namely, I assume that the cost function of firm i is given by

$$C_i(y) = \begin{cases} b_i y + ry^2/2 & \text{if} \quad y < a_i, \\ c_i y - ra_i^2/2 & \text{if} \quad y \geq a_i, \end{cases} \tag{6.1}$$

where $c_i \stackrel{\text{def}}{=} b_i + ra_i$. So, the marginal cost of firm i is a continuous function which looks like the function depicted in Figure 6.1. Here a_i is the measure of scale which can be interpreted as the initial capacity level due to irreversible investment made by the firm in the past; b_i is the marginal cost at the zero level of output; c_i is the marginal cost at high output (exceeding the firm's capacity; the initial funds do not matter in this case),

[10] Actually, Dixit considers a two-stage game (investment prior to production) which is equivalent to the one-stage Cournot oligopoly where the marginal costs are step functions.

which can be interpreted as the efficiency parameter of firm i. Parameter $r > 0$ measures the decrease in the marginal cost that would occur if the

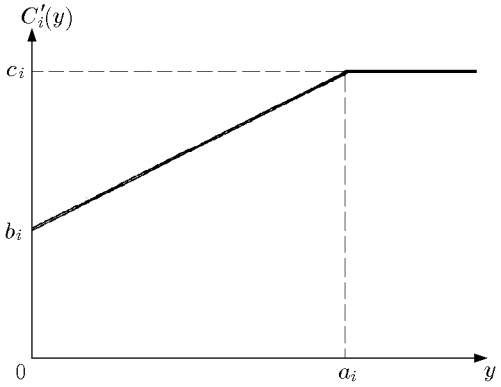

Fig. 6.1. Marginal cost of firm i

initial capital somehow rose by one unit. In other words, r represents the cost of investment in capacities.

As before, let $\tilde{C}_i(y)$ be the actual cost incurred by firm i given by (3.1). Then the first-order condition for the interior solution to the profit maximization problem (3.2) takes the form

$$y_i = \begin{cases} \dfrac{p - \tilde{b}_i}{1 + r} & \text{if} \quad p - \tilde{c}_i < a_i, \\ p - \tilde{c}_i & \text{if} \quad p - \tilde{c}_i \geq a_i, \end{cases} \tag{6.2}$$

where $\tilde{c}_i = c_i - s_i - g$ and $\tilde{b}_i = b_i - s_i - g$. The corresponding profit is given by

$$\Pi_i = \begin{cases} \left(1 + \dfrac{r}{2}\right) y_i^2 & \text{if} \quad y_i < a_i \\ y_i^2 + r a_i^2/2 & \text{if} \quad y_i \geq a_i. \end{cases} \tag{6.3}$$

To study the issue in more detail, let us specialize the distribution of firms with respect to their scale and efficiency. Namely, assume that there are two types of firms. Firms of the first type (denoted by A) are called "large" or "old." They have $a_i = a > 0$ and $c_i = c_A$ (by definition, $b_i = b_A = c_A - ra$). Firms of the second type (denoted by B) are called "small" or "new." They have $a_i = 0$ and $c_i = c_B$ (so, $b_i = c_B$). There are n_A old firms and n_B new ones ($n_A + n_B = n$).

Let us denote by s_A and s_B, respectively, the privileges of old and new firms.[11] Another assumption I make is that a is sufficiently large, so that under the given government policy (s_A, s_B, g), the output of old firms does not exceed a (otherwise, the scale effect is not present, so the results of section 5 can be applied). Then the interior Cournot equilibrium is given by

$$\begin{aligned} y_A &= \frac{(n_B+1)(e_A+s_A) - n_B(e_B+s_B) + g}{R(m_A+n_B+1)}; \\ y_B &= \frac{(m_A+1)(e_B+s_B) - m_A(e_A+s_A) + g}{m_A+n_B+1}. \end{aligned} \tag{6.4}$$

where $e_i = 1 - b_i$ $(i = A, B)$, $R = 1 + r$ and $m_A = n_A/R$.

Now let us calculate y_i' (provided that $y_i' > 0$). As follows from (6.2),

$$y_A' = y_A - \frac{s_A - \Delta p}{R}, \quad y_B' = y_B - s_B + \Delta p. \tag{6.5}$$

where, as usual, Δp is the increase in the market price caused by rejecting privileges. Simple computations show that

$$\Delta p = \frac{s}{m_A + n_B + 1}. \tag{6.6}$$

Combining (6.5) and (6.6), we obtain

$$y_A' = y_A - \frac{\nu}{R} s_A, \quad y_B' = y_B - \nu s_B, \tag{6.7}$$

where $\nu = \dfrac{m_A + n_B}{m_A + n_B + 1}$.

One can see from (6.7) that there is what I call "the scale effect": the impact privileges have on output is weaker for type A than for type B. In other words, old firms are less sensitive to changes in the government policy than new ones. This concerns not only privileges but also general regulations. The reason for the scale effect is that new firms should invest before production while old firms have already got some of the needed funds "for nothing," so they still could maintain almost the same production activity under worse conditions.

The rent from privileges is also influenced by the scale effect:

$$\begin{aligned} h_A &= \rho\nu s_A \Big(2y_A - \frac{\nu}{R} s_A\Big), \\ h_B &= \nu s_B (2y_B - \nu s_B), \end{aligned} \tag{6.8}$$

[11] Again, I exploit the concavity of the government objective function, which implies that s_i are the same within each type.

where $\rho = \dfrac{R+1}{2R} = \dfrac{1+r/2}{1+r}$; $\quad \rho \in (1/2, 1)$.

What is the impact of the scale effect on the equilibrium in the model? The following proposition answers this question.

Proposition 4. *Suppose n is large, the transaction cost of patronage is not very high, $r > 0$ and a is sufficiently high, so the scale effect is present. Then, in equilibrium the government policy (s_A, s_B, g) has the following properties*:

1) *an absolutely benevolent government (with $\mu = 0$) a does not patronize all firms (so, $s_A = 0$ or $s_B = 0$). Which type is patronized depends on the relation between e_A and e_B : privileges are given to relatively more efficient firms*;

2) *for interior equilibria (such that $s_A > 0$ and $s_B > 0$), the level of discrimination, $\Delta s = s_A - s_B$, positively depends on μ. So, a more mercenary government is likely to give more relative advantages to firms of type A in this case*;

3) *however, for low μ when the equilibrium is not interior, Δs may be decreasing or increasing in μ, depending on the efficiency relation e_A/e_B (see Figure 6.2–6.3).*

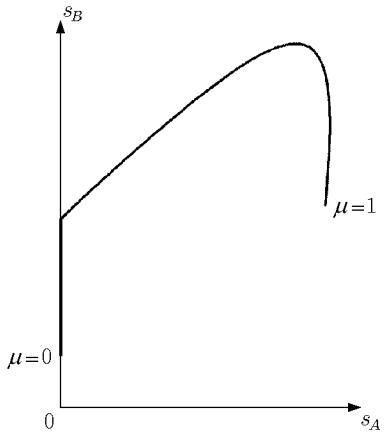

Fig. 6.2. Privilege policy (s_A, s_B) for various μ (small firms are efficient)

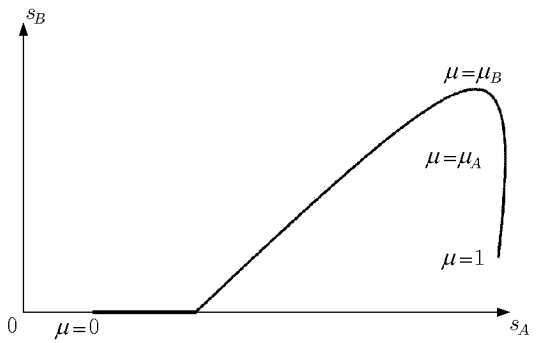

Fig. 6.3. Privilege policy (s_A, s_B) for various μ (large firms are efficient)

Proof. is given in the appendix. □

The main conclusion that could be drawn from Proposition 4 is that a mercenary government not only gives excess privileges, it also brings about a bias in their structure: it gives large firms more advantages than a benevolent government does. This bias is another revelation of the scale effect. Its intuitive explanation may be the following: if the government is benevolent, its aim is to increase the total output by spending as few resources as possible. Since privileges given to type A yield less return in output than those given to type B, then, other things being equal, it is better to patronize type B. On the other hand, if the government is mercenary, it underprovides public goods; firms of type B suffer from such policy more than firms of type A, so the latter have more chances to become leaders and yield high rent. Therefore, it is better for a mercenary government to support type A.

The curious form of the curves in Figure 6.2 and 6.3 is caused by the non-monotonicity of the absolute level of privileges (see Proposition 1). Note that the maximum of s_A is reached at higher μ than the maximum of s_B, which is in accordance with the main result of Proposition 4.

The bias in the structure of privileges seems to be a minor effect, at least the efficiency loss captured by the present model is not very high. However, there are reasons other than short-run welfare to notice this effect. Namely, the bias may influence the long-run perspectives of the regional economic development. Large old firms have low propensity to invest and they

will eventually depreciate, so it is vital for future growth to support new investment projects. The opposite policy may lead to stagnation.

7. CONCLUSION

Summarizing the results presented in the paper, if a mercenary government distributes privileges among non-homogeneous firms, four effects are summed up (and all of them decrease social welfare). Firstly, public goods are underprovided. Secondly, the absolute level of privileges is too high (Proposition 1). Then, the discrimination suppressing inefficient firms may be too severe (Proposition 3). And, finally, there can be a shift in the privilege structure towards large firms (if the scale effect is present).

At the same time, if the government preferences are not very far from the pure welfare criterion, this slight non-benevolence may yield some positive results in spite of its general inefficiency. In particular, new efficient projects may earn serious support from such a government.

How could society detect an inefficient policy? Of course, the local government is not responsible for all problems. However, if there are a variety of privileges and a high percentage of enterprises have somehow or other become recipients of state patronage, this can be a signal of abuse. The same can be said about regions where markets are mostly concentrated in the hands of large agents. Note that according to the Ekspert-200 annual rating, a considerable part of the 200 largest Russian enterprises work in regions with bad investment climate (high risks).

Is it possible to avoid inefficient use of privileges or at least to reduce the negative effects? Of course, the easiest way would be to cancel privileges completely and severely punish all who give (and receive) them. But will such a policy stimulate growth? Absolutely equal conditions for everyone may be non-optimal too. Remember also that punishment for patronage activity can suppress uncontrolled distribution of privileges but will not increase equivalently the provision of public goods and may even worsen the economic conditions. Although, the central government can finance some of the local public goods and thus partly solve this problem. Another way is to impose a ceiling for local taxes. Still, none of these measures can completely solve the problem of inefficient use of privileges.

Clearly, it would be better to eradicate the origins of the inefficiency, i. e., "improve" the incentives of local authorities. Collecting and publishing (using the media and Internet technologies) any information about merce-

nary or inefficient policies of local governments could help voters be aware of who is who and make a right decision at election time.

To conclude, privileges may be a way to encourage efficient producers and attract more investment resources into the region. But privileges may also result from a collusion between self-interested political and business elite. An important function of a regulator is to distinguish the former from the latter.

8. APPENDIX
PROOFS OF SOME STATEMENTS

A. Equivalence of public projects and cost reduction

Under linear demand, government projects generate the same incentive scheme as subsidies, tax discounts and so on. Indeed, suppose that the government employs a firm to carry out some public project, which is equivalent to producing s units of output. The government promises to pay the firm compensation f. If the firm agrees to these terms and its cost function is $C(y)$, then its net profit is given by

$$\Pi' = p(y-s) + f - C(y) = (p+s)y - C(y) - s(p+y) + f. \qquad (8.1)$$

Because of the chosen demand function, the third term in the right-hand side of (8.1) does not depend on y; the fourth term is constant too, so the firm behaves just as if its cost were reduced by s. Its effective payment for the privilege is

$$h = s(1-Y') - f, \qquad (8.2)$$

where Y' is the total output of the other producers. Given the equilibrium of the model of patronage, compensation f can be determined from (8.2).

B. Strict concavity of the government objective function

Let us consider the most general version of the model in which all firms are heterogeneous and firm i is represented by its scale and efficiency parameters, a_i and c_i, $i = 1, \ldots, n$ (see the beginning of section 6 for reference). The privilege given to firm i is s_i and the amount of public goods is g. Then firms may be divided into two classes (let us call them "large" and "small" firms): those who produce (in equilibrium) more than their capacity a_i and the others. Let us order firms so that numbers $i = 1, \ldots, l$ correspond to large firms and $i = l+1, \ldots, n$, to small ones. Denote $m = n - l$.

The optimal production strategy of firm i is then given by (cf (6.4))

$$y_i = \begin{cases} \dfrac{e_i + s_i + g - Y}{R}, & \text{if} \quad i \le l, \\ e_i + s_i + g - Y, & \text{if} \quad i > l. \end{cases} \qquad (8.3)$$

Summing up (8.3) for all $i = 1, \ldots, n$, we obtain

$$Y = \sum_{i=1}^{n} y_i = \sum_{i=1}^{n} f_i + N(g - Y), \tag{8.4}$$

where

$$f_i = \begin{cases} \dfrac{e_i + s_i}{R}, & \text{if} \quad i \le l, \\ e_i + s_i, & \text{if} \quad i > l, \end{cases}$$

$$N = \frac{l}{R} + m + 1.$$

Let us denote

$$\Phi \stackrel{\text{def}}{=} \frac{1}{N}\Big(\sum_{i=1}^{n} f_i - g \Big). \tag{8.5}$$

Then, as follows from (8.4),

$$Y = \Phi + g. \tag{8.6}$$

Substituting (8.6) into (8.3), we obtain the Cournot equilibrium:

$$y_i = \begin{cases} \dfrac{e_i + s_i + \Phi}{R}, & \text{if} \quad i \le l, \\ e_i + s_i + \Phi, & \text{if} \quad i > l \end{cases} \tag{8.7}$$

(according to (8.5), Φ does not depend on y_i).

Now I am going to substitute (8.7) into (3.5) and check the second-order conditions. Actually, it is sufficient to consider the case $\mu = 1$, i. e., check the concavity of welfare W. Indeed, examining (3.9) one can see that $W - V$ is a sum of squares of linear functions of the policy parameters, so $(W - V)'' > 0$ (i. e., the Hessian of $W - V$ is a positive definite matrix). Hence, if $W'' < 0$, then $V'' < 0$ for all $\mu \in [0, 1]$.

Let $W_i = G_i + \Pi_i'$ be the sum of the net profit of firm i and the net revenues it brings to the government. Substituting (8.7) into the corresponding expressions, we obtain

$$W_i = \begin{cases} \dfrac{(e_i + s_i - \Phi)\big[(1+R)(e_i - \Phi) - (2\theta R + r)s_i - 2Rg\big]}{2R^2}, & i \le l, \\ (e_i + s_i - \Phi)(e_i - \theta s_i - \Phi - g), & i > l. \end{cases} \tag{8.8}$$

The consumer surplus is given by

$$CS = \frac{Y^2}{2} = \frac{(\Phi + g)^2}{2}. \tag{8.9}$$

It will be convenient for us to impose new independent variables $\tilde{s}_i$ instead of s_i:

$$\tilde{s}_i = \begin{cases} \dfrac{s_i}{R}, & \text{if} \quad i \le l, \\ s_i, & \text{if} \quad i > l. \end{cases} \tag{8.10}$$

Then

$$\frac{\partial \Phi}{\partial \tilde{s}_i} = \frac{1}{N}, \quad i = 1, \ldots, n. \tag{8.11}$$

Differentiating (8.8) and (8.9) twice with respect to $(\tilde{s}_1, \ldots, \tilde{s}_n)$ (taking into account (8.11)), we obtain

$$A \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_i^2} = \frac{(NR-1)\big[NR(2\theta R + r) + R + 1\big]}{N^2 R^2}, \tag{8.12}$$

$$A' \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_i \partial \tilde{s}_j} = -\frac{R + 1 - NR(1 - \theta R)}{N^2 R^2}, \tag{8.13}$$

$$A'' \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_j \partial \tilde{s}_k} = -\frac{R+1}{N^2 R^2} \quad (i \le l, \quad j, k \ne i), \tag{8.14}$$

$$B \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_i^2} = \frac{2(N-1)(\theta N + 1)}{N^2}, \tag{8.15}$$

$$B' \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_i \partial \tilde{s}_j} = -\frac{2 - N(1-\theta)}{N^2}, \tag{8.16}$$

$$B'' \stackrel{\text{def}}{=} -\frac{\partial^2 W_i}{\partial \tilde{s}_j \partial \tilde{s}_k} = -\frac{2}{N^2} \quad (i > l, \quad j, k \ne i), \tag{8.17}$$

$$C \stackrel{\text{def}}{=} -\frac{\partial^2 CS}{\partial \tilde{s}_j \partial \tilde{s}_k} = -\frac{1}{N^2} \quad (j, k = 1, \ldots, n). \tag{8.18}$$

The aggregate social welfare is given by

$$W = \sum_{i=1}^{n} W_i + CS. \tag{8.19}$$

Hence, the minus matrix of second derivatives (Hessian) of W with respect to $(\tilde{s}_1, \ldots, \tilde{s}_n)$ takes the form

$$M \stackrel{\text{def}}{=} -\left\| \frac{\partial^2 CS}{\partial \tilde{s}_j \partial \tilde{s}_k} \right\|_{j,k=1\ldots n} = \left\| \begin{array}{ccccc|ccccc} a & a' & a' & \cdots & a' & c & c & \cdots & c \\ a' & a & a' & \cdots & a' & c & c & \cdots & c \\ a' & a' & a & \cdots & a' & c & c & \cdots & c \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots \\ a' & a' & a' & \cdots & a & c & c & \cdots & c \\ \hline c & c & c & \cdots & c & b & b' & \cdots & b' \\ c & c & c & \cdots & c & b' & b & \cdots & b' \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \ddots & \vdots \\ c & c & c & \cdots & c & b' & b' & \cdots & b \end{array} \right\|$$

(l columns, m columns)

where

$$a = -\frac{\partial^2 W}{\partial \tilde{s}_i \partial \tilde{s}_i} = A + (l-1)A'' + mB'' + C = \\ = \frac{N(NR-1)(2\theta R + r) - mr + 1}{N^2 R}, \quad (8.20)$$

$$a' = -\frac{\partial^2 W}{\partial \tilde{s}_i \partial \tilde{s}_j} = 2A' + (l-2)A'' + mB'' + C = \\ = \frac{-N(2\theta R + r) - mr + 1}{N^2 R} \qquad (i, j \le l,\ i \ne j), \quad (8.21)$$

$$b = -\frac{\partial^2 W}{\partial \tilde{s}_i \partial \tilde{s}_i} = B + (m-1)B'' + lA'' + C = \\ = \frac{2\theta NR(N-1) + lr + 1}{N^2 R}, \quad (8.22)$$

$$b' = -\frac{\partial^2 W}{\partial \tilde{s}_i \partial \tilde{s}_j} = 2B' + (m-2)B'' + lA'' + C = \\ = \frac{-2\theta NR + lr + 1}{N^2 R} \qquad (i, j > l,\ i \ne j), \quad (8.23)$$

$$c = -\frac{\partial^2 W}{\partial \tilde{s}_i \partial \tilde{s}_j} = A' + (l-1)A'' + B' + (l-1)B'' + C = \\ = \frac{-2\theta NR - mr + 1}{N^2 R} \qquad (i \le l < j). \quad (8.24)$$

The welfare function is strictly concave if and only if M is positive definite. By Silvester's criterion, $M > 0$ if and only if all main minors $M_1, \ldots, M_n$ are positive. After some determinant manipulations, we obtain

$$M_k = \begin{cases} k(a-a')^{k-1}\bar{a}_k, & \text{if} \quad k \le l, \\ l(k-l)(a-a')^{l-1}(b-b')^{k-l-1}\delta_{l,k-l}, & \text{if} \quad k > l, \end{cases} \tag{8.25}$$

where

$$\delta_{ij} = \begin{vmatrix} \bar{a}_i & c \\ c & \bar{b}_j \end{vmatrix}, \tag{8.26}$$

and $\bar{a}_k$ and $\bar{b}_k$ are the averages of the corresponding submatrices:

$$\bar{a}_k = \frac{a + (k-1)a'}{k}, \tag{8.27}$$

$$\bar{b}_k = \frac{b + (k-1)b'}{k}. \tag{8.28}$$

As follows from (8.25), the system of inequalities $M_1 > 0, \ldots, M_n > 0$ turns out to be equivalent to the following simple conditions:

$$\bar{a}_l > 0, \quad \bar{b}_m > 0, \quad a > a', \quad b > b', \quad \delta_{lm} > 0. \tag{8.29}$$

Substituting (8.20)–(8.24) into (8.26)–(8.28), we obtain

$$\bar{a}_l = \frac{(m+1)(2\theta NR + mr - 1) + NR}{N^2R(l-1)} > 0, \tag{8.30}$$

$$\bar{b}_m = \frac{2\theta lNR + (mN-1)m^2R + m}{N^2Rm} > 0, \tag{8.31}$$

$$a - a' = 2\theta R + r > 0, \tag{8.32}$$

$$b - b' = 2\theta > 0, \tag{8.33}$$

$$\delta_{lm} = \frac{(2\theta+1)(2\theta NR + mr) - 2\theta}{N^2R(l-1)m} > 0. \tag{8.34}$$

Thus, second-order conditions (8.29) hold. Hence, the government objective function is strictly concave in $(s_1, \ldots, s_n)$. This is a very important property. Firstly, it guarantees that the first-order conditions of the optimum are applicable. Secondly, under strict concavity, the optimal policy cannot assign different privileges to identical firms. Indeed, if we change the order in which these firms are numbered, we get another local optimum, which is impossible for strictly concave functions.

To complete the proof, the concavity in g and in (s, g) immediately follows from the positivity of the denominator in the corresponding first-order conditions because it is proportional to the determinant of the Hessian $V''(s, g)$.

3. Proof of Proposition 4

For the sake of computational simplicity, I will look for some approximation to the equilibrium rather than for the exact equilibrium. The approximation concerns the determination of the privilege rent h_i. Namely, I neglect the impact of the firm's decision about accepting patronage at the equilibrium price in the subsequent oligopolistic game, i. e., Δs in (6.5) is set as zero. The error of this approximation is proportional to $1/n$, i. e., is close to zero for high n. Thus, we have the following approximate formulas for y_i' and the privilege rents:

$$\begin{aligned} y_A' &= y_A - \frac{s_A}{R}, \\ y_B' &= y_B - s_B, \end{aligned} \tag{8.35}$$

$$\begin{aligned} h_A &= \rho s_A \Big(2y_A - \frac{s_A}{R}\Big), \\ h_B &= s_B(2y_B - s_B). \end{aligned} \tag{8.36}$$

So, the rents generated by privileges are slightly overestimated. Besides, I am not going to correct formulas (8.35)–(8.36) in the case where some firms have zero net profit. Neither of these two simplifications will affect the qualitative results.

As before, we should maximize the authority's objective function (3.5) with respect to $s_A \geq 0$, $s_B \geq 0$ and g. Solving the first-order conditions, we obtain the following interior equilibrium:

$$\begin{aligned} s_A = \frac{n_B\big\{\mu(1+\mu)\big[(1+\theta)m - 2l\big] - \theta(2\mu - \theta/2)(\eta - \rho)\big\}(e_A - e_B)}{Q} + \\ + \frac{\theta\big[m_A(2\mu\rho - \theta)e_A + n_B(2\mu - \eta)e_B\big]}{Q}, \end{aligned} \tag{8.37}$$

$$s_B = \frac{m_A\{\mu(1+\mu)[2\rho l-(1+\theta)m]+\theta(1+\theta)(2\mu\rho-\theta/2)\}(e_A-e_B)}{Q}+$$
$$+\frac{(2\mu\eta m-\theta l)e_B-2m_A\theta\mu\rho^2(e_A-e_B)}{Q}, \quad (8.38)$$

$$g=$$
$$=\frac{-2\mu[m_An_B(1-\rho)(\rho-\eta\theta)(e_A-e_B)+(\rho m_Ae_A+n_Be_B)(\mu l+2\eta\theta)]}{Q}+$$
$$+\frac{\theta(1+\theta)(\theta m_Ae_A+\eta n_Be_B)}{Q}, \quad (8.39)$$

where

$$\eta = 1+\theta-\rho,$$
$$m = \rho m_A+n_B,$$
$$l = \theta m_A+\eta n_B,$$
$$Q = 2\mu((1+\mu)l+2\eta\theta)m-\theta^2$$

($Q>0$ at the interior equilibrium).

As follows from (8.37)–(8.39), if $\mu=0$, then the equilibrium cannot be interior. Hence, either $s_A=0$ or $s_B=0$. Which case is realized depends on the relation e_A/e_B. Specifically, provided that $\theta<1/2$, we have

$$s_A = \frac{\{(\rho-\eta)n_B^2+m_A[(1-\theta)n_B-\theta]\}e_A}{2ln_B-\theta^2m_A}-$$
$$-\frac{n_B[(\rho-\eta)n_B+m_A(1-\theta)+2\eta-\theta]e_B}{2ln_B-\theta^2m_A}, \quad (8.40)$$

$s_B=0$

if $e_A/e_B>\beta_A$ and

$s_A=0$,

$$s_B = -\frac{m_A[\theta(2\rho-1)+m'-l]e_A}{2m_A[l+2\theta(1-\rho)]-\theta^2n_B}+$$
$$+\frac{\{m_A(\theta[2\rho-1)+m'-l]+m_A[2(1-\rho)-\theta]-\theta n_B\}e_B}{2m_A[l+2\theta(1-\rho)]-\theta^2n_B}, \quad (8.41)$$

if $e_A/e_B < \beta_B$. Here the following notations are used:

$$m' = m_A + \rho n_B,$$
$$\beta_A = 1 + \frac{r + \theta R(m_A/n_B + 1)}{n - \theta R\big[m_A/n_B + m_A + n_B\big]},$$
$$\beta_B = 1 + \frac{r - \theta R(m_A/n_B + 1)}{n + \theta\big[1 - (m_A + n_B)R\big]} \quad (\beta_B < \beta_A).$$

If $\beta_B \le e_A/e_B \le \beta_A$, then the benevolent government gives privileges to no one at all.

Note that there is $\beta \in (\beta_B, \beta_A)$ (this β can be calculated) such that if $e_A/e_B < \beta$, then the equilibria for various μ look like points along the curve in Figure 6.2, and if $e_A/e_B > \beta$, then Figure 6.3 is applicable. Note also that β_A, β_B and β tend to $1 + r/n$ as $\theta \to 0$.

Finally, let us study the behavior of $s_A - s_B$ for interior equilibria. Using (8.37)–(8.38), we obtain

$$\frac{\partial(s_A - s_B)}{\partial\mu} = \frac{2(1-\rho)}{Q^2/(2\mu^2 m + \theta^2)} \times$$
$$\times \frac{\big\{\theta m_A \rho e_A m' + l n_B e_B + n_B m_A (1+\theta)(1-\rho)\big[(\rho-\theta)e_B + \theta e_A\big]\big\}}{Q^2/(2\mu^2 m + \theta^2)} \tag{8.42}$$

One can see that if $\theta < 1/2$, then the right-hand side of (8.42) is positive, so the level of discrimination is increasing in μ. Q.E.D.

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